CLAIMS

1. A stent delivery system comprising:

a catheter having a guidewire lumen at least partially therethrough, and having a fluid pressurizing lumen therein separate from said guidewire lumen, said fluid pressurizing lumen extending between a proximal end thereof and a fluid opening at a distal end of said catheter;

said catheter having a compressed stent retention section which extends at least a compressed stent length in a first direction along said catheter from a stent cup plunger engaged with said catheter at a location near a distal end of said catheter, said catheter having a sheath retraction section which extends from said stent cup plunger in a second direction which is opposite said first direction to a fixed seal mount fixed to said catheter, said catheter further containing a fluid receiving chamber section containing said fluid opening, said fluid receiving chamber section extends from said fixed seal mount in said second direction to a maximum fluid receiving chamber extension length;

a stent containment sheath having a movable seal mount near an end thereof, wherein said stent containment sheath in a pre stent deployment position is positioned surrounding a portion of a distal end of said catheter including said compressed stent retention section, said stent cup plunger, said sheath retraction section, said fixed seal mount, and a minimum fluid receiving chamber extension length, wherein said stent containment sheath in a post stent deployment position is positioned surrounding a portion of a distal end of said catheter including said stent cup plunger, said sheath retraction section, said fixed seal mount, and a substantial portion of said maximum fluid receiving chamber extension length, wherein a stent retention portion of said stent containment sheath is made of a first material having a lubricious inner surface suitable for easy release of a stent contained therein, wherein a stent retraction portion of said stent containment sheath is made of a second material having a smooth inner surface against which a first flexible seal structure of a fluid receiving chamber seals;

wherein said first flexible seal structure is disposed engaged with said fixed seal mount to flexibly seal between said catheter and said stent containment sheath at a first end of said fluid receiving chamber, said first flexible seal structure maintains

engagement with said fixed seal mount as said fluid receiving chamber is pressurized and said stent containment sheath moves with respect to said catheter; and

a second flexible seal structure disposed engaged with said movable seal mount and flexibly sealing between said catheter and said stent containment sheath at an end opposite said first end of a fluid receiving section and maintaining engagement with said movable seal mount as said fluid receiving chamber is pressurized and said stent containment sheath moves with respect to said catheter.

2. A stent delivery system as in Claim 1, further comprising:

an anti-kinking spacer loosely contained within said stent containment sheath and outside said sheath retraction section of said catheter and extending substantially between ends of said sheath retraction section and sized to substantially interfere with the kinking of said stent containment sheath at a location adjacent to said anti-kinking spacer when said stent containment sheath containing a portion of said catheter is bent.

3. A stent delivery system as in Claim 2,

wherein said anti-kinking spacer is a helical spring.

4. A stent delivery system as in Claim 3,

wherein said anti-kinking spacer is a helical spring having a substantially planar coil shape.

5. A stent delivery system as in Claim 4,

wherein said anti-kinking spacer is a helical spring having a substantially planar coil shape whose thickness larger near the central longitudinal axis of the helix and tapers to a smaller thickness near its outer edge.

6. A stent delivery system as in Claim 2,

wherein said anti-kinking spacer is a is a series of stacked rings.

7. A stent delivery system as in Claims 1, 2, 3, 4, 5, or 6,

wherein and inside diameter of said stent containment sheath opposite said compressed stent retention section and the inside diameter of said stent containment sheath opposite said retraction section and said fluid receiving chamber are the substantially the same.

8. A stent delivery system as in Claim 7,

wherein said catheter has fixed to it a backstop which prevents fluid from being released from the fluid receiving chamber by the stent containment sheath moving so far with respect to the catheter that said fluid receiving chamber is no longer sealed by said first flexible seal structure.

9. A stent delivery system as in Claim 1, 2, 3, 4, 5, or 6,

wherein and inside diameter of said stent containment sheath opposite said compressed stent retention section and the inside diameter of said stent containment sheath opposite said retraction section and said fluid receiving chamber are substantially different.

10. A stent delivery system as in Claim 9,

wherein said catheter has fixed to it a backstop which prevents fluid from being released from the fluid receiving chamber by the stent containment sheath moving so far with respect to the catheter that said fluid receiving chamber is no longer sealed by said first flexible seal structure.

11. A stent graft delivery system comprising:

a catheter having a guidewire lumen at least partially therethrough, and having a fluid pressurizing lumen therein separate from said guidewire lumen, said fluid pressurizing lumen extending between a proximal end thereof and a fluid opening at a distal end of said catheter;

said catheter having a compressed stent graft retention section which extends at least a compressed stent graft length in a first direction along said catheter

from a stent graft cup plunger engaged with said catheter at a location near a distal end of said catheter, said catheter having a sheath retraction section which extends from said stent graft cup plunger in a second direction which is opposite said first direction to a fixed seal mount fixed to said catheter, said catheter further containing a fluid receiving chamber section containing said fluid opening, said fluid receiving chamber section extends from said fixed seal mount in said second direction to a maximum fluid receiving chamber extension length;

a stent graft containment sheath having a movable seal mount near an end thereof, wherein said stent graft containment sheath in a pre stent graft deployment position is positioned surrounding a portion of a distal end of said catheter including said compressed stent graft retention section, said stent graft cup plunger, said sheath retraction section, said fixed seal mount, and a minimum fluid receiving chamber extension length, wherein said stent graft containment sheath in a post stent graft deployment position is positioned surrounding a portion of a distal end of said catheter including said stent graft cup plunger, said sheath retraction section, said fixed seal mount, and a substantial portion of said maximum fluid receiving chamber extension length, wherein a stent graft retention portion of said stent graft containment sheath is made of a first material having a lubricious inner surface suitable for easy release of a stent graft contained therein, wherein a stent graft retraction portion of said stent graft containment sheath is made of a second material having a smooth inner surface against which a first flexible seal structure of a fluid receiving chamber seals;

wherein said first flexible seal structure is disposed engaged with said fixed seal mount to flexibly seal between said catheter and said stent graft containment sheath at a first end of said fluid receiving chamber, said first flexible seal structure maintains engagement with said fixed seal mount as said fluid receiving chamber is pressurized and said stent graft containment sheath moves with respect to said catheter; and

a second flexible seal structure disposed engaged with said movable seal mount and flexibly sealing between said catheter and said stent graft containment sheath at an end opposite said first end of a fluid receiving section and maintaining engagement

with said movable seal mount as said fluid receiving chamber is pressurized and said stent graft containment sheath moves with respect to said catheter.

12. A stent graft delivery system as in Claim 11, further comprising:

an anti-kinking spacer loosely contained within said stent graft containment sheath and outside said sheath retraction section of said catheter and extending substantially between ends of said sheath retraction section and sized to substantially interfere with the kinking of said stent graft containment sheath at a location adjacent to said anti-kinking spacer when said stent graft containment sheath containing a portion of said catheter is bent.

13. A stent graft delivery system as in Claim 12,

wherein said anti-kinking spacer is a helical spring.

14. A stent graft delivery system as in Claim 13,

wherein said anti-kinking spacer is a helical spring having a substantially planar coil shape.

15. A stent graft delivery system as in Claim 14,

wherein said anti-kinking spacer is a helical spring having a substantially planar coil shape whose thickness larger near the central longitudinal axis of the helix and tapers to a smaller thickness near its outer edge.

16. A stent graft delivery system as in Claim 12,

wherein said anti-kinking spacer is a is a series of stacked rings.

17. A stent graft delivery system as in Claims 11, 12, 13, 14, 15, or 16,

wherein and inside diameter of said stent graft containment sheath opposite said compressed stent graft retention section and the inside diameter of said stent graft containment sheath opposite said retraction section and said fluid receiving chamber are the substantially the same.

18. A stent graft delivery system as in Claim 17,

wherein said catheter has fixed to it a backstop which prevents fluid from being released from the fluid receiving chamber by the stent graft containment sheath moving so far with respect to the catheter that said fluid receiving chamber is no longer sealed by said first flexible seal structure.

19. A stent graft delivery system as in Claim 11, 12, 13, 14, 15, or 16,

wherein and inside diameter of said stent graft containment sheath opposite said compressed stent graft retention section and the inside diameter of said stent graft containment sheath opposite said retraction section and said fluid receiving chamber are substantially different.

20. A stent graft delivery system as in Claim 19,

wherein said catheter has fixed to it a backstop which prevents fluid from being released from the fluid receiving chamber by the stent graft containment sheath moving so far with respect to the catheter that said fluid receiving chamber is no longer sealed by said first flexible seal structure.

21. A stent delivery system comprising:

a catheter having a guidewire lumen at least partially therethrough, and having a fluid pressurizing lumen therein separate from said guidewire lumen, said fluid pressurizing lumen extending between a proximal end thereof and a fluid opening at a distal end of said catheter;

said catheter having a compressed stent retention section which extends at least a compressed stent length in a first direction along said catheter from a stent cup plunger engaged with said catheter at a location near a distal end of said catheter, said catheter having a sheath retraction section which extends from said stent cup plunger in a second direction which is opposite said first direction to a fixed seal mount fixed to said catheter, said catheter further containing a fluid receiving chamber section containing

said fluid opening, said fluid receiving chamber section extends from said fixed seal mount in said second direction to a maximum fluid receiving chamber extension length;

a stent containment sheath having a movable seal mount near an end thereof, wherein said stent containment sheath in a pre stent deployment position is positioned surrounding a portion of a distal end of said catheter including said compressed stent retention section, said stent cup plunger, said sheath retraction section, said fixed seal mount, and a minimum fluid receiving chamber extension length, wherein said stent containment sheath in a post stent deployment position is positioned surrounding a portion of a distal end of said catheter including said stent cup plunger, said sheath retraction section, said fixed seal mount, and a substantial portion of said maximum fluid receiving chamber extension length;

a first flexible seal structure disposed engaged with said fixed seal mount and flexibly sealing between said catheter and said stent containment sheath at a first end of said fluid receiving chamber, said first flexible seal structure maintains engagement with said fixed seal mount as said fluid receiving chamber is pressurized and said stent containment sheath moves with respect to said catheter;

a second flexible seal structure disposed engaged with said movable seal mount and flexibly sealing between said catheter and said stent containment sheath at an end opposite said first end of a fluid receiving section and maintaining engagement with said movable seal mount as said fluid receiving chamber is pressurized and said stent containment sheath moves with respect to said catheter; and.

an anti-kinking spacer loosely contained within said stent containment sheath and outside said sheath retraction section of said catheter and extending substantially between ends of said sheath retraction section and sized to substantially interfere with the kinking of said stent containment sheath at a location adjacent to said anti-kinking spacer when said stent containment sheath containing a portion of said catheter is bent.

22. A stent graft delivery system comprising:

a catheter having a guidewire lumen at least partially therethrough, and having a fluid pressurizing lumen therein separate from said guidewire lumen, said fluid

pressurizing lumen extending between a proximal end thereof and a fluid opening at a distal end of said catheter;

said catheter having a compressed stent graft retention section which extends at least a compressed stent graft length in a first direction along said catheter from a stent graft cup plunger engaged with said catheter at a location near a distal end of said catheter, said catheter having a sheath retraction section which extends from said stent graft cup plunger in a second direction which is opposite said first direction to a fixed seal mount fixed to said catheter, said catheter further containing a fluid receiving chamber section containing said fluid opening, said fluid receiving chamber section extends from said fixed seal mount in said second direction to a maximum fluid receiving chamber extension length;

a stent graft containment sheath having a movable seal mount near an end thereof, wherein said stent graft containment sheath in a pre stent graft deployment position is positioned surrounding a portion of a distal end of said catheter including said compressed stent graft retention section, said stent graft cup plunger, said sheath retraction section, said fixed seal mount, and a minimum fluid receiving chamber extension length, wherein said stent graft containment sheath in a post stent graft deployment position is positioned surrounding a portion of a distal end of said catheter including said stent graft cup plunger, said sheath retraction section, said fixed seal mount, and a substantial portion of said maximum fluid receiving chamber extension length;

a first flexible seal structure disposed engaged with said fixed seal mount and flexibly sealing between said catheter and said stent graft containment sheath at a first end of said fluid receiving chamber, said first flexible seal structure maintains engagement with said fixed seal mount as said fluid receiving chamber is pressurized and said stent graft containment sheath moves with respect to said catheter;

a second flexible seal structure disposed engaged with said movable seal mount and flexibly sealing between said catheter and said stent graft containment sheath at an end opposite said first end of a fluid receiving section and maintaining engagement with said movable seal mount as said fluid receiving chamber is pressurized and said stent graft containment sheath moves with respect to said catheter; and.

an anti-kinking spacer loosely contained within said stent graft containment sheath and outside said sheath retraction section of said catheter and extending substantially between ends of said sheath retraction section and sized to substantially interfere with the kinking of said stent graft containment sheath at a location adjacent to said anti-kinking spacer when said stent graft containment sheath containing a portion of said catheter is bent.

23. The stent delivery system as in Claim 1 or 11

wherein a wall thickness of said first material of said stent retention portion is different than a wall thickness of said second material of said stent retraction portion.

24. The system according to Claim 11 wherein said stent graft assembly is a self-expanding stent graft assembly.

24. A method for hydraulically retracting a stent containment sheath comprising the steps of:

providing a catheter having fixed seal fixed to a fixed seal mount thereon, with a fluid receiving chamber section on one side of said fixed seal and an anti kinking spacer on a second side of said with a plunger cup disposed at the end of said antikinking spacer opposite the fixed seal with a stent in a compressed pre deployment position disposed around the stent at a stent retention section of the catheter beyond the plunger cup;

surrounding a portion of a distal end of said catheter with a containment sheath such sheath containing said fixed seal and said fixed seal mount and said antikinking spacer and said plunger cup and said stent in said pre deployment position, said containment sheath being sized to seal against said fixed seal of said catheter and including a movable seal which moves with the containment catheter and seals against said catheter to establish a fluid receiving chamber between the catheter, the containment sheath and the fixed seal and the movable seal; and

injecting fluid into a lumen of said catheter in communication with a fluid opening in said fluid receiving chamber, such pressurization causing said retraction sheath to retract with respect to said catheter and uncover the stent for deployment.

25. The method of Claims 24,

wherein the stent containment sheath is constructed from at least two different diameter tubes.

26. The method of Claim 24,

wherein the stent containment sheath is constructed from at least two different material having substantially different surface lubricity.